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REPORT BY THE U.S.

General Accounting Office

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Effects Of Alaskan North Slope Crude Oil And Continued Crude Oil Production At Elk Hills Naval Petroleum Reserve

North Slope crude oil is displacing Middle East crude oil imports into the West Coast and it improved our balance-of-payments in excess of \$1.3 billion during 1977. Because of refinery configurations and environmental requirements to import Indonesian type crude oils, North Slope crude oil will continue to create a surplus on the West Coast.

The desire to use Elk Hills crude oil to mitigate foreign crude oil imports prompted increased production. Some displacement of foreign crude oil imports is occurring, therefore production at Elk Hills should be maintained at commensurate levels.

RELEASED



EMD-78-78
JULY 19, 1978



UNITED STATES GENERAL ACCOUNTING OFFICE
WASHINGTON, D.C. 20543

ENERGY AND MINERALS
DIVISION

B-66927

The Honorable John Moss
House of Representatives

Dear Mr. Moss:

Pursuant to your request and discussions with your office, we reviewed the Alaska North Slope (North Slope) and Elk Hills Naval Petroleum Reserve No. 1 (Elk Hills) crude oil production.

We examined (1) the potential for North Slope crude oil to displace foreign crude oil imports, (2) its resultant impact on our Nation's balance-of-payments, and (3) crude oil production at Elk Hills. We also examined whether North Slope crude oil is contributing to a surplus of crude oil on the West Coast and the possibilities of alleviating such surplus. Our observations and conclusions are included as appendix I.

Effects of Alaskan North Slope
Crude Oil

Our review has shown that North Slope crude oil is displacing some heavy, sour foreign crude oil imports into the West Coast because of their similar qualities and yields.

The Middle East crude oil imports, which have long represented an integral part of foreign crude oil imports into that region, show a downward trend. The North Slope's production of crude oil also improved our balance-of-payments by an estimated \$1.3 billion during calendar year 1977.

However, because of its limited refinery desulfurization capacity, the West Coast refining industry, as presently configured, cannot process all available North Slope crude oil and, therefore, it will not displace light, sweet foreign crude oil imports (Indonesian) into the West Coast in the short

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term. According to the Department of Energy (DOE), about 31 percent of the West Coast refining capacity is designed to process sweet crude oils similar to those from Indonesia. West Coast refineries have been blending Indonesian crude oil with the heavy, sour crude oils from the North Slope, California, and the Middle East to meet the growing demand for gasoline and other light, low sulfur products, which help meet State air quality standards.

Although some believe it is desirable for refiners to install additional desulfurization equipment or to retrofit present equipment, other constraints exist that discourage refiners from making these transitions, i.e., (1) high capital cost and (2) the lack of a market for residual fuel oil on the West Coast.

Short of shutting-in some production, there are alternatives for disposing of North Slope crude oil which is surplus to West Coast refinery requirements. The alternatives include (1) movement by overland pipeline to refineries in the midwest and southwest, (2) movement by tanker through the Panama Canal to refineries in the Gulf and East Coasts, and (3) exchanges with foreign countries on a barrel-for-barrel basis. Because the overland pipelines have not been constructed, only options 2 and 3 can be exercised at this time. The administration decided against exchanges with foreign countries, and North Slope crude oil surplus to West Coast needs is presently being shipped through the Panama Canal.

Although an exchange with Japan would result in transportation cost savings to the North Slope crude oil owners, these transportation savings may have to be shared with Japanese refiners to induce them into an exchange. DOE estimates the net gain from an exchange, considering transportation costs, crude oil quality adjustments, and import charges, would range from \$0.54 to \$1.34 per barrel. (See table in app. I on p. 9.)

According to DOE, in July 1977 the administration rejected the option to exchange surplus North Slope crude oil with Japan, despite the estimated transportation savings, for the following reasons:

- It was not certain that refiners would pass to consumers much of the transportation cost savings from an exchange.

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--Temporary approval of exchanges might tend to lessen the incentives of oil companies and various State permitting authorities to proceed expeditiously with the approval and construction of needed west-to-east pipelines.

--The belief that allowing exchanges would undermine the administration's efforts to make the public aware of the Nation's domestic energy supply shortage, and the need for conservation of those resources.

We believe that another important consideration is the effect an exchange agreement would have on our security of crude oil supplies. The United States would be giving up domestic supplies for an equalizing share of Japan's imported crude oil supplies. Although it is uncertain which country, or mix of countries, would provide the equalizing share, it is likely that the crude oil would come from either Saudi Arabia or Iran. These countries have contributed over 50 percent of Japan's crude oil imports each year over the last 4 years.

We continue to support the position taken in our recent report 1/ that assuming the surplus will be long term, the west-east pipeline system is the preferred transportation alternative for surplus North Slope crude oil. In that report, we recommended that the Congress enact legislation to expedite the issuance of required Federal approvals of transportation systems to move surplus crude oil to Northern Tier and other inland States.

However, given the uncertainty and concerns associated with an exchange agreement as outlined above, in the interim, continued shipment of oil through the Panama Canal to the Gulf and East Coasts would appear to be the most sound course of action. Any future proposal by the President to allow an exchange of Alaskan crude oil should be given congressional consideration under the authority of the Export Administration Amendments of 1977, with assurance that satisfactory solutions are provided to the above four concerns.

1/"Potential For Deepwater Port Development in the United States," EMD-78-9, Apr. 5, 1978.

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Effects of Continued Production at
Elk Hills

Elk Hills is currently producing 125,000 barrels per day (b/d) of crude oil primarily from two zones, Stevens (75,000 b/d) and Shallow (50,000 b/d). The Stevens Zone crude oil is a relatively light, sweet crude oil; its 1977 production averaged 66,024 b/d. Stevens Zone reserves are estimated to contain about 700 million barrels, and the current estimated maximum efficient rate of production (MER) is about 210,000 b/d. This crude oil is used to meet the demand for gasoline, low sulfur fuel oil, and distillates (that portion of the crude oil which is removed as a vapor and condensed during a distillation process, e.g., diesel, kerosene, and heating oil). It also is blended with heavier, sour crude oils to achieve a balanced supply of crude oil for processing and is used as a diluent (a diluting agent used to thin heavy crude oils) to move additional quantities of California heavy crude oil through pipelines to Los Angeles and San Francisco. Stevens Zone crude oil is comparable to some African light, sweet crude oil imports.

The Shallow Zone crude oil is a heavy, sour crude oil; its 1977 production averaged 43,872 b/d. Shallow Zone reserves are estimated to contain about 300 million barrels, and the current estimated MER is 50,000 b/d. It is used to meet the demand for lubricating oils and residual oil products.

The two major constraints on increasing Elk Hills crude oil production are lack of (1) transportation systems to accommodate increased production levels and (2) sufficient field production facilities to reinject increased amounts of natural gas associated with raising production levels.

Despite North Slope crude oil supplies, benefits still accrue to our national interest from production at Elk Hills, including

--improvements in our balance-of-payments (about \$580 million in calendar year 1977) and the receipt of Federal revenues (about \$427 million in calendar year 1977) and

--displacement of crude oil imports.

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Elk Hills' crude oil production also offers several benefits to California's crude oil supply needs. Our analysis of Elk Hills' calendar year 1977 crude oil production has shown that:

- Stevens Zone light, sweet crude oil provides the San Joaquin Valley (Valley) refiners with a supply of crude oil that meets the demand for gasoline and distillates. According to the Independent Refiners Association of California, if Elk Hills were shut-in, the Valley refiners would be forced to truck-in imported light, sweet crude oil.
- Stevens Zone crude oil also is used as a diluent with locally produced heavy crude oil, enabling unheated pipelines in the Valley to carry more heavy crude oil than would otherwise be possible. Without the light crude oil as a diluent, some heavy crude production would be shut-in. Chevron U.S.A. and several Valley refiners have indicated that increasing Stevens Zone production could assist in marketing more California heavy crude oil production.
- Officials from Chevron U.S.A. and Powerine Oil Company have stated that if the Shallow Zone production were shut-in, they would import Arabian crude oils to meet their product demands. Combined, these companies currently refine about 90 percent of the Shallow Zone crude oil.

Several California independent oil producers believe that Elk Hills crude oil has taken a share of their market, resulting in shut-in production and that Elk Hills is contributing to the crude oil surplus on the West Coast. No one we contacted, however, could furnish any quantifiable evidence that Elk Hills crude oil is limiting California crude oil production or contributing considerably to the crude oil surplus on the West Coast, and our review did not otherwise disclose any such evidence.

Some members of the California Independent Producers Association believe that a portion of Elk Hills could be shut-in until after transportation systems are developed to move Elk Hills crude oil to an area where it is needed, or until refinery retrofit programs in California will allow full usage of all California production. Other independent producers feel that all Shallow Zone crude oil pro-

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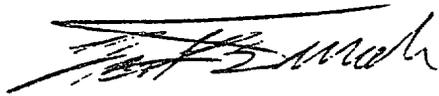
duction should cease without delay and only that amount of Stevens Zone crude oil needed as a diluent should be produced.

On June 15, 1978, new regulations and administrative actions were announced by DOE designed to stimulate the currently depressed market for heavy, sour crude oil produced in California. According to DOE, these actions will increase incentives for producers to maintain production of heavy California crude oil to mitigate the Nation's growing dependence on foreign crude oil. The President also recently requested DOE to prepare a complete analysis of the options available for exporting California's surplus heavy, sour crude oil to technically foreign refineries in the Bahamas and the Caribbean so that the refined product could be reimported to the United States. The analysis is expected to be completed in July 1978.

The desire to use Elk Hills crude oil to mitigate foreign crude oil imports led to a change in legislation to increase crude oil production. Our review has shown that some displacement of foreign crude oil imports is occurring and, as long as this continues, production at Elk Hills should be maintained at commensurate levels. In addition, we believe that at current production levels, Elk Hills is not contributing considerably to the crude oil surplus on the West Coast.

At your request, we did not take the additional time to obtain written comments on this report; however, it was discussed informally with Department of Energy officials and their comments were incorporated as appropriate. We plan no further distribution of this report until 3 weeks from the date of its issuance. At that time, we will send copies to interested parties and make copies available to others upon request.

Sincerely yours,



For

Monte Canfield, Jr.
Director

EFFECTS OF ALASKAN NORTH SLOPE CRUDE OIL
AND CONTINUED CRUDE OIL PRODUCTION
AT ELK HILLS

CRUDE OIL PRODUCTION ON THE
ALASKAN NORTH SLOPE

Oil was discovered at Prudhoe Bay on the Alaskan North Slope in January 1968. Within months of the discovery, every major oil company having lease holdings began active exploration in the Prudhoe Bay area. The Prudhoe Bay field is estimated to contain 10 billion barrels of recoverable reserves.

North Slope crude oil began to flow through the Trans-Alaska Pipeline System (TAPS) in June 1977; by July 1977 it was transporting 600,000 barrels per day (b/d). Current throughput is about 1.16 million b/d. The TAPS throughput is not expected to reach 1.2 million b/d until late in summer 1978 because the crude oil now being produced is heavier than expected and has a higher than expected viscosity (the property of a fluid which indicates its ability to resist flow). During the early 1980s, the flow through TAPS may be increased to 1.6 million b/d and, if further major discoveries are made, it could later be increased to 2 million b/d, which is the pipeline's design capacity.

North Slope crude oil is described as being heavy (27 degrees American Petroleum Institute (API) gravity) ^{1/} and sour (1 percent sulfur content). Heavy crude oils are those with a high density or low API gravity. Generally, crude oils having a gravity of 32 degrees API or less are called heavy crude oils. Sour crude oils are those that contain relatively high amounts of sulfur (greater than 0.5 percent). When refined by distillation, sour crude oils yield relatively large percentages of high-sulfur residual products (heavy fuel oils, asphalt, and petroleum coke). In contrast, light, sweet crude oils, such as Indonesian (36 degrees API and 0.07 percent sulfur), are those with a low density or high gravity (greater than 35 degrees API gravity) and contain relatively low amounts of sulfur (less than 0.5 percent). Light, sweet crude oils are desirable because they yield high amounts of gasoline, jet fuel, and other light, low sulfur products, which help meet air quality standards.

^{1/}API gravity is the measure of the mass of a fluid relative to water that ranges from about 10 degrees for heavy crude oils to 45 degrees for light crude oils.

NORTH SLOPE CRUDE OIL IS DISPLACING
SIMILAR IMPORTS AND IMPROVING
OUR BALANCE-OF-PAYMENTS

North Slope crude oil is displacing some heavy, sour foreign crude oil imports into PAD District V ^{1/} because of their similar qualities; it also is improving our balance-of-payments. We were unable to determine from available information the actual number of barrels of Saudi Arabian and other Middle East crude oils that have been displaced by North Slope crude oil. However, our analysis (see table below) indicates that North Slope crude oil is displacing foreign imports. The Middle East crude oil imports, which have long represented an integral part of foreign crude oil imports into PAD District V, show a downward trend. While Indonesian crude oil import statistics also showed decreases for some months, the change was due, in part, to the increased use of natural gas by electric utilities (natural gas is environmentally preferable) and not the advent of North Slope crude oil.

^{1/}PAD District V is the Petroleum Administration for Defense District--the West Coast. It comprises the following States: Alaska, Arizona, California, Hawaii, Nevada, Oregon, and Washington.

CRUDE OIL IMPORTS AND NORTH SLOPE
SHIPMENTS INTO PAD DISTRICT V

<u>Months</u>	<u>Total foreign crude oil imports (note a)</u>	<u>Middle East crude oil imports</u>	<u>Indonesian crude oil imports</u>	<u>North Slope crude oil shipments</u>
(1977)	----- (b/d) -----			
Jan. to June (avg.)	1,246,600	530,000	472,500	-
July	1,321,900	651,700	399,500	-
Aug.	1,080,500	401,600	384,200	362,600
Sept.	766,300	393,600	276,500	321,100
Oct.	701,500	305,200	275,500	481,300
Nov.	783,000	235,400	399,900	627,000
Dec.	719,700	253,900	344,200	543,700

a/Total foreign crude oil imports in 1974 averaged 766,000 b/d; in 1975, about 803,000 b/d; and in 1976, about 983,400 b/d.

Our analysis further indicates that during the 5-month period ended December 1977, about 630,000 b/d of crude oil were loaded on vessels at Valdez, Alaska, destined for refining on the West, Gulf, and East coasts. Of that total, an average of 468,300 b/d were destined for PAD District V. During the same period, crude oil imports from Iran and Saudi Arabia averaged about 173,600 b/d, a decrease of about 208,000 b/d from the first 7 months' average.

A specific example of actual displacement can be seen in the operations of Chevron U.S.A. Chevron U.S.A. has backed out about 200,000 b/d of its Middle East crude oil imports because of available North Slope and Elk Hills crude oil. Chevron U.S.A. was previously importing about 240,000 b/d from the Middle East.

Our analysis also indicates that the North Slope production contributed to an estimated improvement of about

\$1.3 billion in our balance-of-payments for calendar year 1977 and about \$875 million for the first quarter of 1978. The expected increase in North Slope crude oil production to 1.2 million b/d late in summer 1978, should result in even greater improvements.

NORTH SLOPE CRUDE OIL WILL NOT
DISPLACE INDONESIAN CRUDE OIL
IMPORTS BUT WILL CREATE A SURPLUS

Because of the limited refinery desulfurization (the removal of sulfur from hydrocarbons) capacity on the West Coast and environmental requirements to import light, sweet crude oil in the short term, North Slope crude oil will continue to create a surplus in excess of West Coast refinery requirements.

During 1977 West Coast refineries imported an average of about 409,000 b/d of Indonesian light, sweet crude oil to blend with the heavy, sour crude oils from Alaska, California, and the Middle East to meet the growing demand for gasoline and other light, low sulfur products which help meet State air quality standards. Indonesian crude oils also produce residual fuel oils that meet California air quality standards without any further processing. Refineries built to process sour crude oils have the flexibility to handle sweet crude oils; however, refineries built to process sweet crude oils are limited in their ability to process sour crude oils. According to the Department of Energy (DOE), about 31 percent of the PAD District V refining capacity is designed to process sweet crude oils.

Other factors that will not allow North Slope crude oil to displace Indonesian crude oil in the short term are

- the high capital costs to retrofit an existing sweet crude oil refinery to process sour crude oil (about \$50 million for a 52,000 b/d refinery);
- the high capital cost for desulfurization equipment (in excess of \$200 million for a 100,000 b/d refinery); and
- products produced from high sulfur, low gravity crude oils (primarily high sulfur residual fuel oil) have less market potential on the West coast.

A PACE study ^{1/} concludes that because of economics and inadequate desulfurization capacity, the demand for light, sweet foreign crude oil imports in PAD District V will continue through 1990 as shown below.

	<u>DEMAND</u>		
	<u>1980</u>	<u>1985</u>	<u>1990</u>
	------(b/d)-----		
Foreign sweet crude oil imports	722,000	664,000	428,000

While some light, sweet crude oil refineries have been and more will be extensively modified to process the heavy, sour North Slope crude oil, such modifications will require about 3 years to complete. DOE has indicated that no more than 600,000 to 800,000 b/d of refining capacity for North Slope crude oil on the West Coast is expected to be operational before 1980. With the April 1978 TAPS throughput of 1.14 million b/d, about 580,000 b/d appeared to be in excess of West Coast requirements. The April 1978 West Coast supply and demand picture is shown below:

	<u>Barrels per day</u>
Supply:	
North Slope	1,141,000
Southern Alaska	155,000
California (including Elk Hills)	941,000
Foreign imports	<u>663,000</u>
(Sweet--75 percent)	
(Sour--25 percent)	
Total Supply	2,900,000
Refinery demands	<u>2,320,000</u>
Excess to West Coast Requirements	<u>580,000</u>

^{1/}The PACE Company Consultants and Engineers of Houston, Texas, prepared a study, entitled "The Impact of Elk Hills Crude Production on California Markets," in August 1977 for the Department of the Navy.

EXCHANGING SURPLUS ALASKAN CRUDE
OIL WITH A FOREIGN COUNTRY

Short of shutting-in some production, there are alternatives for disposing of North Slope crude oil in excess of West Coast refinery requirements. The alternatives include (1) movement by overland pipeline to refineries in the midwest and southwest, (2) movement by tanker through the Panama Canal to refineries in the Gulf and East Coasts, and (3) exchanges with foreign countries on a barrel-for-barrel basis. Because the overland pipelines have not been constructed, only options 2 and 3 can be exercised at this time. Since the administration decided against exchanges with foreign countries, North Slope crude oil surplus to West Coast needs is presently being shipped through the Panama Canal.

Our analysis of calendar year 1977 crude oil production on the North Slope indicates that about 160,000 b/d of crude oil were loaded at the port of Valdez for shipment through the Panama Canal to refineries in the Gulf and East Coasts. However, in 1978 shipments have increased considerably. The average monthly volumes are shown in the following table.

<u>Months</u>	<u>Loaded at Valdez for passage through Panama Canal (b/d)</u>
Aug. 1977	108,000
Sept. 1977	238,000
Oct. 1977	208,000
Nov. 1977	98,000
Dec. 1977	151,000
Jan. 1978	141,000
Feb. 1978	231,000
Mar. 1978	383,000
Apr. 1978	562,000

The Mineral Leasing Act of 1920 (30 U.S.C. 185), as amended by the Trans-Alaska Pipeline Authorization Act (43 U.S.C. 1652) prohibits the export of any domestically produced oil that is carried in pipelines over Federal rights-of-way. There are exceptions to this prohibition. If a country is adjacent to the United States, the oil may be exchanged for a similar quantity or transported across such a country before reentering the United States as a convenience or to increase efficiency of transportation.

Also, if transportation of the crude oil does not fall within these exceptions, the prohibition may be waived if the President finds that the export of oil (1) will not diminish the total quantity or quality of petroleum available to the United States, (2) is in the national interest, and (3) is in accord with the provisions of the Export Administration Act of 1969 (50 U.S.C. 2403).

The Export Administration Amendments (50 U.S.C. 2401 et seq.), passed by the Congress in June 1977, in effect require that DOE's crude oil entitlements program ^{1/} be amended to capture any transportation cost savings that might accrue from an exchange and pass the savings on to refiners. Although not required, refiners could pass through the savings. The law also provides that either house of the Congress could reverse a Presidential decision allowing exports.

According to DOE, the potential is negligible for exchanging North Slope crude oil with oil from the adjacent countries of Canada and Mexico. In the near term, exchanges of North Slope crude oil with Canada would require transporting the crude oil by tanker to Canada's eastern provinces where refineries are capable of processing it. With regard to Mexico, transportation systems that would be necessary to exchange considerable volumes of crude oil do not exist.

Japan is considered to be the most likely Nation to exchange compensating volumes of crude oil it is importing for surplus North Slope crude oil. According to DOE, Japan can absorb the North Slope crude oil surplus and has ex-

^{1/}The Entitlements Program is a method of allocating the benefit of low-cost old oil among refiners, so that there could be an equitable crude oil cost distribution among sectors of the petroleum industry as required by the Emergency Petroleum Allocation Act of 1973.

pressed an interest in an exchange arrangement. Japan relies on imported oil for about 95 percent of its domestic consumption. Most of these imports (88 percent, or 4.2 million b/d in 1977) come from the Organization of Petroleum Exporting Countries.

Although such an exchange would result in transportation cost savings to the North Slope crude oil owners, these transportation savings may have to be shared with Japanese refiners to induce them into an exchange. DOE estimates the net gain from an exchange considering transportation costs, crude quality adjustments, and import charges would range from \$0.54 1/ to \$1.34 2/ per barrel as shown in the following table.

1/Decrease of \$1.24 per barrel for the North Slope owner and an increase of \$0.70 per barrel for the Japanese refiner.

2/Decrease of \$1.24 and \$0.10 per barrel for the North Slope owner and Japanese refiner, respectively.

DOE's 1977 Evaluation of Costs Associated
with Exchanging Surplus North Slope Crude Oil

	<u>Cost per barrel</u>	
	<u>North Slope crude oil owner</u>	<u>Japanese refiner</u>
Transportation costs without an exchange:		
Alaska to Gulf Coast	\$2.70	
Persian Gulf to Japan		\$.75
Unloading losses and fee (note a)	<u>.18</u>	<u>.07</u>
Total costs without an exchange	<u>\$2.88</u>	<u>\$.82</u>
Transportation costs with an exchange:		
Alaska to Japan (U.S. flag vessel)		\$1.25
Persian Gulf to Gulf Coast	\$1.35	
Unloading losses and fee	<u>.18</u>	<u>.07</u>
Total costs with an exchange	<u>\$1.53</u>	<u>\$1.32</u>
Reduction in transportation costs with an exchange:		
Crude Quality Adjustments (note b)	\$1.35	-\$.50
Import Charge at Gulf Coast (note c)	.10	- .20
Gain from an exchange:	<u>-\$.21</u>	<u>-</u>
Foreign flag vessel from Alaska to Japan (note d)	<u>\$1.24</u>	<u>-\$.70</u>
Adjusted gain from an exchange	<u>-</u>	<u>.80</u>
Adjusted gain from an exchange	<u>\$1.24</u>	<u>\$.10</u>

a/An unloading loss represents the volume of crude oil that cannot be pumped from the tanker. An unloading fee is charged for unloading tankers at nonproprietary facilities.

b/Crude oil quality adjustments reflect the differences in crude oil values to the two parties.

c/In this analysis, the foreign barrel of crude oil entering the United States is assumed to incur the full \$0.21 import fee. This becomes a factor that reduces the total gain from an exchange.

d/Foreign tanker rate is \$0.45 per barrel.

According to DOE, in July 1977 the administration rejected the option to exchange surplus North Slope crude oil with Japan, despite the estimated transportation savings, for the following reasons:

- It was not certain that refiners would pass to consumers much of the transportation cost savings from an exchange.
- Temporary approval of exchanges might tend to lessen the incentives of oil companies and various State permitting authorities to proceed expeditiously with the approval and construction of needed west-to-east pipelines.
- The belief that allowing exchanges would undermine the administration's efforts to make the public aware of the Nation's domestic energy supply shortage, and the need for conservation of those resources.

We believe that another important consideration is the effects an exchange agreement would have on our security of crude oil supplies. The United States would be giving up domestic supplies for an equalizing share of Japan's imported crude oil supplies. Although it is uncertain which country, or mix of countries, would provide the equalizing share, it is likely that the crude oil would come from either Saudi Arabia or Iran. These countries have contributed over 50 percent of Japan's crude oil imports each year over the last 4 years.

Saudi Arabia provides Japan with enough crude oil (about 1,620,000 b/d in 1977) to allow exchanges with U.S. refineries while maintaining some level of crude oil imports consistent with Japan's desire to diversify its crude oil supply sources. If Iran supplied the crude oil, such an exchange could effectively divert more than half of Japan's imports from Iran (about 300,000 b/d in 1977) and more than double U.S. imports from that country.

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We continue to support the position taken in our recent report 1/ that assuming the surplus will be long term, the

1/"Potential for Deepwater Port Development in the United States," EMD-78-9, Apr. 5, 1978.

west-east pipeline system is the preferred transportation alternative for surplus North Slope crude oil. In that report we recommended that the Congress enact legislation to expedite the issuance of required Federal approvals of transportation systems to move surplus oil to Northern Tier and other inland States.

However, given the uncertainty and concern associated with an exchange agreement as outlined above, in the interim, continued shipment of crude oil through the Panama Canal to the Gulf and East Coasts would appear to be the most sound course of action. Any future proposal by the President to allow an exchange of Alaskan crude oil should be given congressional consideration under the authority of the Export Administration Amendments of 1977, with assurance that satisfactory solutions are provided to the above four concerns.

ELK HILLS CRUDE OIL PRODUCTION

Prior to enactment of the Naval Petroleum Reserves Production Act of 1976 (10 U.S.C. 7420), production of crude oil at Elk Hills Naval Petroleum Reserve No. 1 (Elk Hills) was maintained at a level sufficient for testing and field maintenance. The act provided for, among other things, (1) the development and production of Elk Hills at its maximum efficient rate (MER) consistent with sound engineering practices for a period of 6 years and (2) development of the capability for transporting 350,000 b/d of crude oil from Elk Hills to shipping or marketing points no later than April 5, 1979. On October 1, 1977, the Naval Petroleum and Oil Shale Reserves were transferred from the Department of Defense to DOE.

To comply with the congressional mandate of procuring or constructing pipeline capacity of at least 350,000 b/d, DOE is using existing oil pipelines and plans to construct a new pipeline. In 1976 arrangements were made for about 140,000 b/d of crude oil to be transported to shipping or marketing points through existing pipelines in the vicinity of Elk Hills. By October 1980 the remaining 200,000 to 250,000 b/d are expected to be transported through a 167-mile pipeline to be constructed from Elk Hills to the vicinity of Rialto, California, where it will tie in with the proposed Standard Oil Company of Ohio pipeline, which will run from Long Beach, California, to Midland, Texas. If environmentally acceptable, the Elk Hills pipeline will be extended 13 miles to Colton, California, where it will tie into the Atlantic Richfield Company's Four Corners pipeline system.

A DOE official told us that because of uncertainties surrounding the approval of the Standard Oil Company of Ohio pipeline, the start of the Elk Hills pipeline was delayed. The House and Senate Armed Services Committees have been notified that the statutory deadline of April 1979 will not be met. Legislation has been recommended which, among other things, would extend the pipeline completion date.

The House Armed Services Committee, in its fiscal year 1979 authorization bill for the Naval Petroleum and Oil Shale Reserves (H.R. 12557), amended 10 U.S.C. 7420, to require development of the Naval Petroleum Reserves to a capacity to produce at MER for the purposes of national defense and to limit the production of the Naval Petroleum Reserves, except Naval Petroleum Reserve No. 2, to the lowest rate sufficient to support (1) the cost of exploration, development, and operation of the Naval Petroleum Reserves and (2) the cost of any land acquisition necessary at the Reserves. It is estimated that, if this amendment is passed, production at the Naval Petroleum Reserves will be reduced to about 35,000 b/d.

The two major constraints on increasing production at Elk Hills are the lack of (1) transportation facilities to accommodate increased production levels and (2) sufficient field production facilities to reinject increased amounts of natural gas associated with the increased levels of oil production.

Due to various gas plant mechanical problems, crude oil production at Elk Hills averaged only about 110,000 b/d during 1977. Current production is 125,000 b/d and comes primarily from two zones, the Stevens (75,000 b/d) and Shallow (50,000 b/d).

The Stevens Zone crude oil is a relatively light, sweet crude oil (30 degrees to 37 degrees API and 0.30 to 0.50 percent sulfur); its 1977 production averaged 66,024 b/d. Stevens Zone reserves are estimated to contain about 700 million barrels, and the current estimated MER is 210,000 b/d. This crude oil is used to meet the demand for gasoline, low sulfur fuel oil, and distillates (that portion of the crude which is removed as a vapor and condensed during a distillation process, e.g., diesel, kerosene, and heating oil). It is also blended with heavier, sour crude oils to achieve a balanced supply of crude oil for processing and is used as a diluent (a diluting agent used to thin heavy

crude oils) to move additional quantities of California heavy crude oils through pipelines to Los Angeles and San Francisco. Stevens Zone crude oil is comparable to some African light, sweet crude oil imports.

The Shallow Zone crude oil is a heavy, sour crude oil (20 degrees to 25 degrees API and 0.70 to 1.00 percent sulfur); its 1977 production averaged 43,872 b/d. Shallow Zone reserves are estimated to contain about 300 million barrels, and the current estimated MER is 50,000 b/d. It is used to meet the demand for lubricating oils and residual oil products.

MERITS OF CONTINUED CRUDE OIL
PRODUCTION AT ELK HILLS

Despite North Slope crude oil supplies, benefits still accrue to our national interest from production at Elk Hills, including

- improvements in our balance-of-payments and the receipt of Federal revenues and
- displacement of crude oil imports.

Our analysis of calendar year 1977 crude oil production from Elk Hills shows an improvement in our balance-of-payments of about \$580 million and the receipt of about \$427 million from the sales of crude oil and other products.

According to another PACE Study ^{1/} the Stevens Zone crude oil production could displace as much as 30,000 b/d of the moderate and low sulfur imported crude oils from Africa. Officials from Chevron U.S.A. and Powerine Oil Company have stated that if the Shallow Zone production were shut-in, they would import Arabian crude oils to meet their product demands. Combined, these companies currently refine about 90 percent of the Shallow Zone crude oil.

^{1/}The PACE Company Consultants and Engineers of Houston, Texas, prepared a study, entitled "Elk Hills Crude Oil Markets and Transportation Alternatives in Emergency Situations," in October 1977 for the Department of the Navy.

Also, Elk Hills crude oil has potential for filling a portion of the Strategic Petroleum Reserve. In our prior report ^{1/} and in a June 29, 1977, letter addressed to the Subcommittee on Energy and Power, House Committee on Interstate and Foreign Commerce, we stated that to the extent that Elk Hills crude oil is suitable for storage and costs no more than other available crude oil, it should be used directly or through exchange agreements to fill a portion of the Reserve.

LOCAL BENEFITS FROM ELK HILLS

Elk Hills' crude oil production also offers several benefits to California's crude oil supply needs. Our analysis of Elk Hills calendar year 1977 crude oil production has shown that:

--Stevens Zone light, sweet crude oil provides the San Joaquin Valley (Valley) refiners with a supply of crude oil that can meet the demand for gasoline and distillates. About 50 percent of the Valley refineries were designed to process predominantly light crude oils. Also, Stevens Zone crude oil is blended with heavier crude oils to achieve a balanced supply of crude oil for processing. With the decline in production of other light, sweet California crude oil, Valley refiners have become dependent upon Elk Hills' Stevens Zone crude oil. According to the Independent Refiners Association of California, if Elk Hills were shut-in, the Valley refiners would be forced to truck-in imported light, sweet crude oils.

--Stevens Zone crude oil also is used as a diluent with locally produced heavy crude oil, enabling unheated pipelines in the Valley to carry more heavy crude oil than would otherwise be possible. Without the light crude oil as a diluent, some heavy crude oil production would be shut-in. Chevron U.S.A. and several Valley refiners have indicated that increasing Stevens Zone production could assist in marketing more California heavy crude oil production. Pipelines currently carry heavy, sour crude oil production from the Valley to Los Angeles and San Francisco

^{1/}"Issues Needing Attention in Developing the Strategic Petroleum Reserve," EMD-77-20, Feb. 16, 1977.

refineries which are equipped to handle that quality of crude oil. Getty, Mobil, and Chevron U.S.A. now use some heated lines to move heavy crude oil out of the Valley. The availability of additional Stevens Zone crude oil would help to reduce the energy expenditures required to heat these lines as well as improve product yields at the refinery.

--Shallow Zone crude oil is highly naphthenic (crude oils with a high content of naphthenic hydrocarbons and a low pour point). Chevron U.S.A. knows of no other foreign or domestic crude oils of comparable quality for manufacturing low viscosity index lube oils (for use in solvents, as an extreme-pressure lubricant additive in electric transformers in severe weather, cutting metals, and as a diluent in an additive for motor gasoline).

INDEPENDENT OIL PRODUCERS' OPPOSITION TO ELK HILLS PRODUCTION

Several California independent oil producers believe that Elk Hills crude oil has taken a share of their market, resulting in shut-in production and that Elk Hills is contributing to the crude oil surplus on the West Coast. No one we contacted, however, could furnish any quantifiable evidence that Elk Hills crude oil is limiting California crude oil production or contributing considerably to the crude oil surplus on the West Coast, and our review did not disclose any such evidence.

Some members of the California Independent Producers Association believe that a portion of Elk Hills could be shut-in until after transportation systems are developed to move Elk Hills crude oil to an area where it is needed, or until refinery retrofit programs in California will allow full usage of all California production. Other independent producers feel that all Shallow Zone crude oil production should cease without delay and only that amount of Stevens Zone crude oil needed as a diluent should be produced.

Also, the Independent Petroleum Association of America and the California Independent Producers Association believe that the Government gives special treatment to its own crude oil from Elk Hills because it can be sold at uncontrolled prices and refiners receive an entitlement advantage. According to one Valley producer, this entitlement advantage

APPENDIX I

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gives refiners an incentive to purchase Elk Hills crude oil rather than the same type of crude oil produced by the independents in the San Joaquin Valley.

On June 15, 1978, new regulations and administrative actions were announced by DOE designed to stimulate the currently depressed market for heavy, sour crude oil produced in California. According to DOE, these actions will increase incentives for producers to maintain production of heavy California crude oil to mitigate the Nation's growing dependence on foreign crude oil. Specifically, DOE is (1) providing further entitlement relief for heavy California crude oil and (2) establishing a program to provide economic incentives for transporting California crude oil to Gulf Coast, East Coast, and other domestic refineries.

The President also recently requested DOE to prepare a complete analysis of the options available for exporting California's surplus heavy, sour crude oil to technically foreign refineries in the Bahamas and the Caribbean so that the refined product could be reimported to the United States. The analysis is expected to be completed in July 1978.

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The desire to use Elk Hills crude oil to mitigate foreign crude oil imports led to a change in legislation to increase production. Our review has shown that some displacement of foreign crude oil imports is occurring and, as long as it continues, production at Elk Hills should be maintained at commensurate levels. In addition, we believe that at current production levels, Elk Hills is not contributing considerably to the crude oil surplus on the West Coast.

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